



B. Georges Bank haddock

Garm-III Model Meeting
25 – 29 February 2008
Woods Hole, MA

Statistical Areas

- NEFSC statistical areas:
- 521, 522, 525, 526, 537, 538, 539, 551, 552, 561, 562

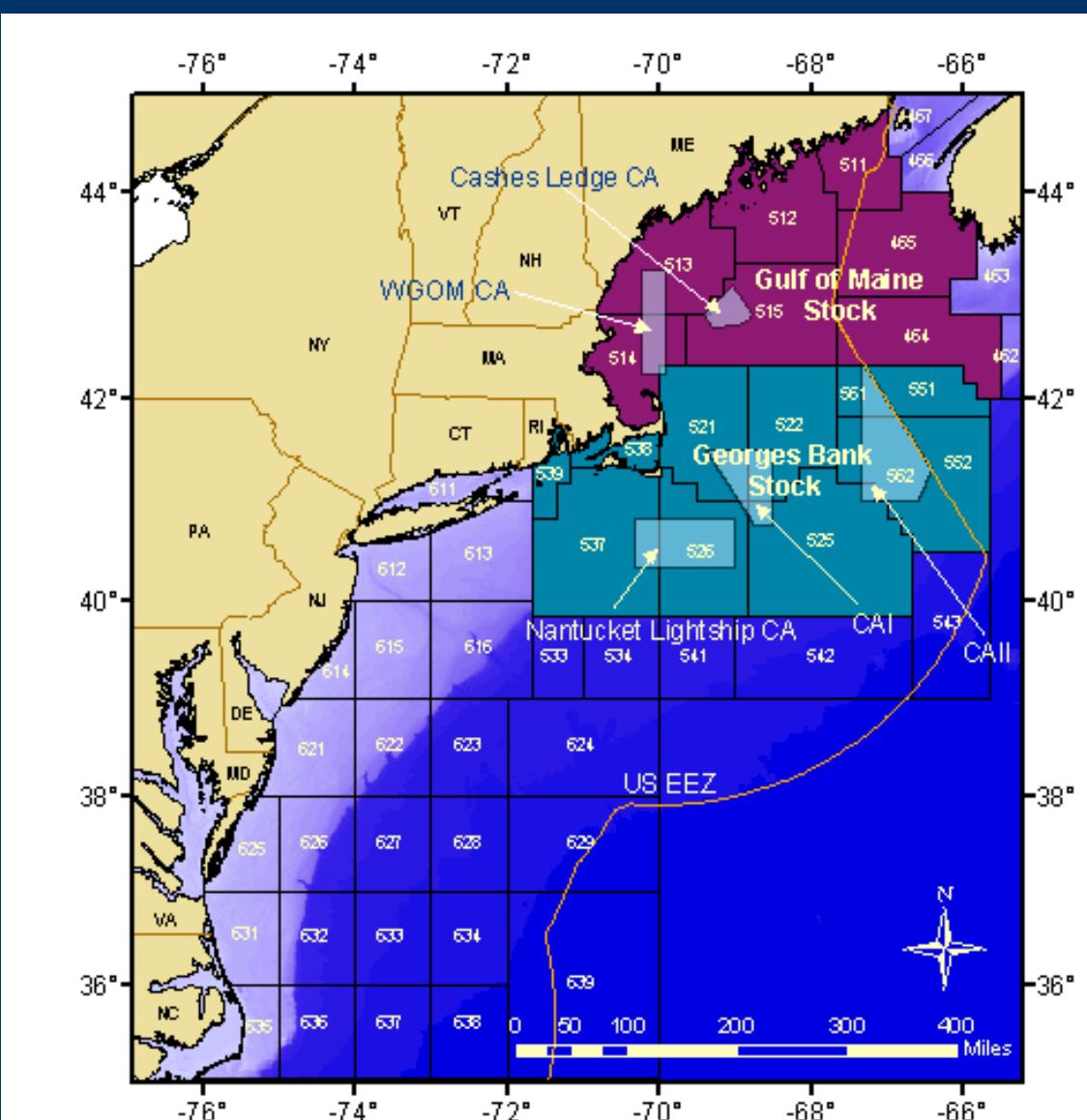
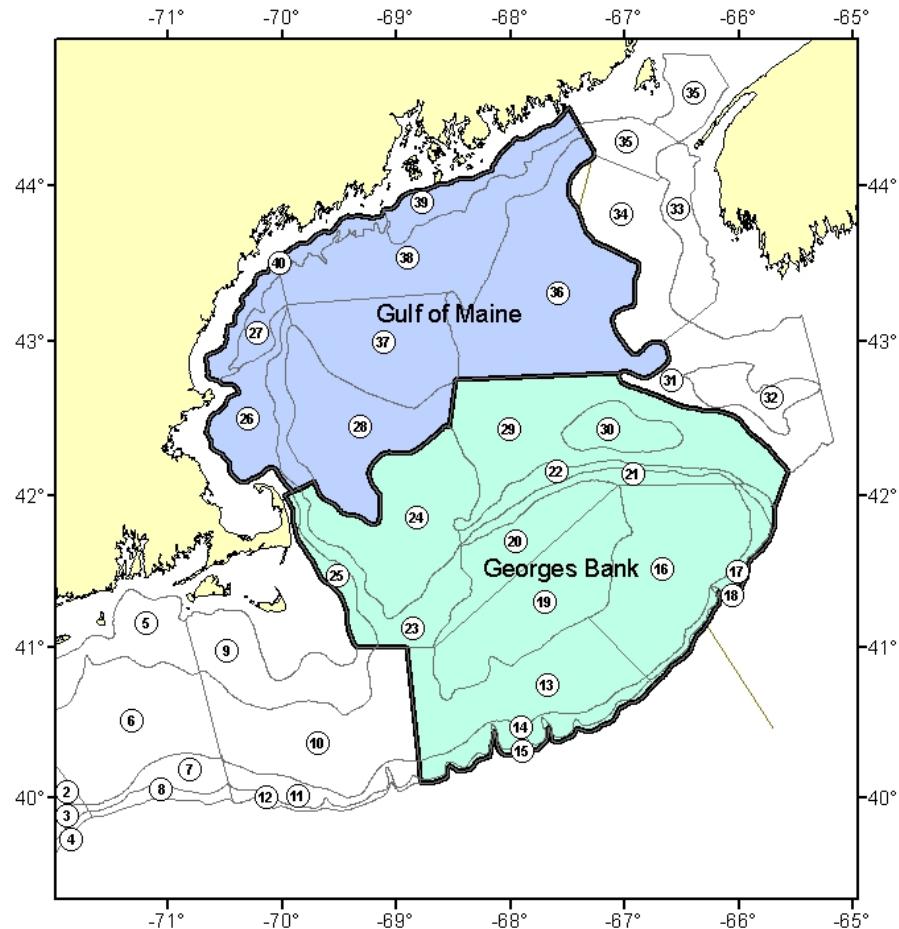


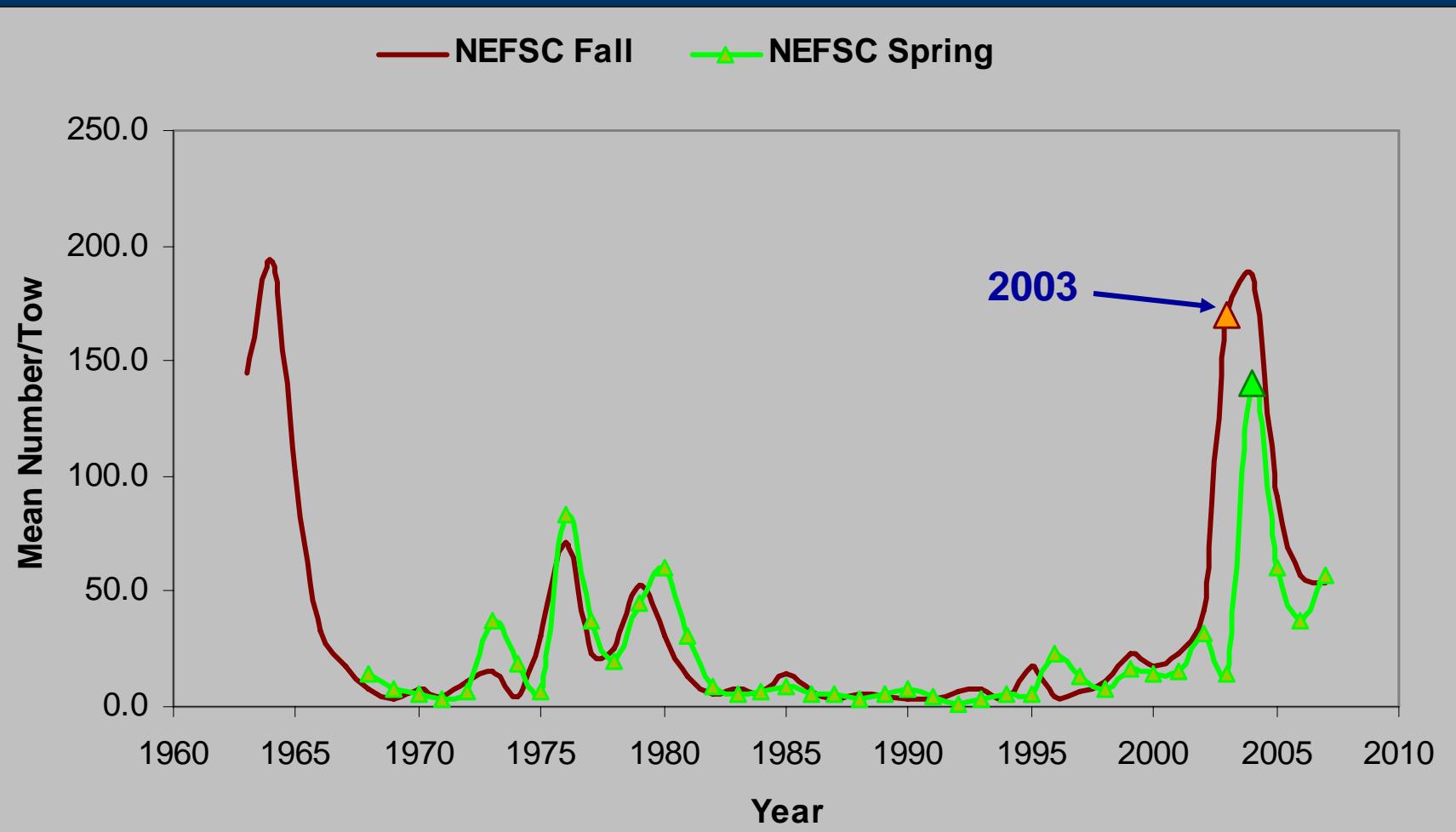
Figure 2.1. Statistical areas used to define the Gulf of Maine and Georges Bank haddock stocks.

Survey Strata

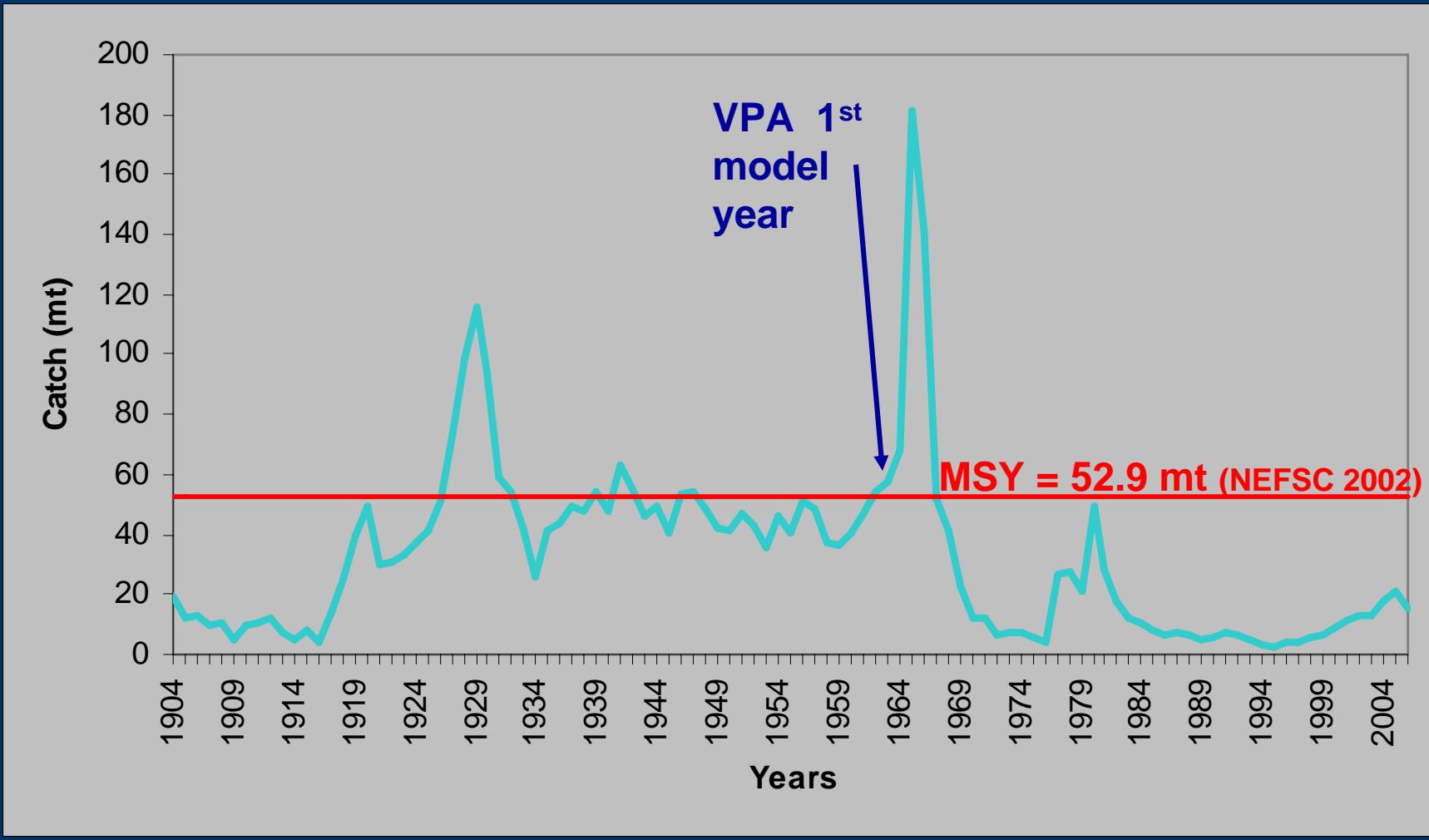
- NEFSC survey strata:
- 13-25, 29, 30



Survey Trends



Historical Landings



Precision of inputs—CAA

Table 5. Coefficients of variation at age for Georges Bank haddock in years 2000-2003 using half-year time steps from 1000 bootstraps.
(Data workshop, BioStat bootstrapping)

Year	age2	age3	age4	age5	age6	age7	age8	age9+
2000	0.25	0.13	0.13	0.11	0.10	0.16	0.23	0.40
2001	0.37	0.10	0.10	0.10	0.08	0.10	0.15	0.19
2002	1.36	0.30	0.09	0.10	0.12	0.13	0.15	0.19
2003	1.31	0.26	0.17	0.05	0.13	0.09	0.13	0.13

Precision of model inputs—discards

Year	EGB		WGB		Total GB	
	Discards	CV	Discards	CV	Discards	CV
1989	126.2	0.8	221.5	1.1	347.8	0.7
1990	93.6	1.4	11.9	1.8	105.5	1.3
1991	0.0		52.8	2.9	52.8	2.9
1992	3.7	3.2	75.8	1.2	79.4	1.2
1993	103.4	0.9	57.9	2.0	161.3	0.9
1994	1065.3	2.1	1782.4	1.5	2847.7	1.2
1995	0.4	1.3	133.7	1.0	134.1	1.0
1996	3.1	0.9	257.4	2.3	260.5	2.2
1997	1.0	1.5	346.1	1.7	347.1	1.7
1998	0.0	0.7	432.6	1.8	432.7	1.8
1999	5.3	0.6	89.5	1.3	94.8	1.2
2000	2.7	0.6	118.8	0.6	121.5	0.6
2001	19.3	1.2	323.5	0.6	342.8	0.6
2002	17.0	0.7	338.3	0.4	355.4	0.4
2003	88.4	0.6	170.8	0.4	259.2	0.4
2004	282.2	0.8	1997.2	1.6	2279.4	1.4
2005	75.1	0.6	1045.6	0.2	1120.7	0.2
2006	254.5	0.4	1941.4	0.0	2195.9	0.3

Current Model

- VPA applied for entire history of stock
- Pros
 - No retrospective problem in recent years
 - Good age sampling to characterize CAA
 - Indices and age data back to 1963 (contrast)
- Cons
 - Cannot go back prior to 1963
 - Cannot separately model landings and discards
 - Cannot incorporate error in catch

Current Status

Yield and SSB per Recruit-based Reference Points

$$F_{0.1} = 0.26$$

$$F_{40\%} = 0.26$$

MSY-based Reference Points

$$\text{MSY} = 52,900 \text{ mt}$$

$$\text{SSB}_{\text{MSY}} = 250,300 \text{ mt} \quad \text{SSB}_{2004} = 116,800$$

$$F_{\text{MSY}} = 0.26 \quad F_{2004} = 0.24$$

Alternative model: ASAP

- Greater flexibility
- Internal estimation of reference points
- Ability to impose/ignore stock-recruit fn.
- Could incorporate historic landings, gaps in age information, separate discards

Greater flexibility = **MANY** more tuning options...



Conclusion

- Recommend to explore Model: ASAP
- Fallback model: VPA
- Issues to be resolved
 - tuning in ASAP (selectivity, F and Recr devs)
 - whether (or how tightly) to impose a S-R fn.
 - reference point estimation (*which* maturity, weight, selectivity values at age)
 - Landings vs discards
 - Compare internal/external ref pt estimation?

The End

NEFSC-AUTUMN

Year	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9+
1963	83.93	25.39	9.22	6.81	8.34	5.95	2.04	1.68	1.18	0.46
1964	2.37	112.87	63.74	5.83	1.79	3.81	1.56	0.69	0.25	0.33
1965	0.33	10.16	77.39	9.70	1.07	0.80	0.91	0.80	0.25	0.27
1966	6.14	0.95	2.89	18.39	3.35	0.52	0.49	0.33	0.12	0.07
1967	0.03	6.72	0.36	1.00	6.76	1.62	0.49	0.21	0.33	0.18
1968	0.09	0.06	0.95	0.13	0.33	3.86	1.27	0.27	0.16	0.39
1969	0.39	0.03	0.00	0.28	0.13	0.16	1.52	0.51	0.09	0.27
1970	0.04	4.13	0.21	0.01	0.28	0.27	0.51	1.37	0.48	0.40
1971	2.43	0.00	0.31	0.07	0.01	0.22	0.03	0.09	0.75	0.28
1972	6.75	2.52	0.00	0.52	0.09	0.00	0.09	0.06	0.03	1.30
1973	3.23	9.00	1.61	0.00	0.19	0.04	0.00	0.07	0.01	0.72
1974	0.75	1.77	0.98	0.31	0.00	0.01	0.00	0.00	0.00	0.22
1975	23.48	0.63	0.72	4.86	0.92	0.00	0.03	0.00	0.01	0.30
1976	4.32	64.17	0.52	0.54	0.82	0.30	0.00	0.04	0.10	0.25
1977	0.13	2.14	18.73	0.56	0.57	0.64	0.34	0.04	0.01	0.09
1978	13.22	0.84	1.04	9.27	0.18	0.26	0.45	0.01	0.00	0.01
1979	1.32	45.57	0.04	0.90	3.81	0.26	0.28	0.05	0.01	0.00
1980	11.68	2.71	12.72	0.45	0.18	1.70	0.48	0.46	0.09	0.06
1981	0.38	6.13	2.08	3.70	0.21	0.42	0.53	0.00	0.00	0.01
1982	1.36	0.00	1.33	0.34	1.40	0.13	0.07	0.21	0.01	0.10
1983	5.80	0.24	0.21	0.27	0.30	0.94	0.12	0.00	0.10	0.01
1984	0.03	3.32	0.88	0.24	0.28	0.06	0.45	0.00	0.00	0.12

1985	11.35	0.65	1.53	0.22	0.05	0.10	0.07	0.17	0.00	0.05
1986	0.00	5.11	0.09	1.21	0.06	0.13	0.13	0.02	0.03	0.03
1987	1.80	0.00	0.79	0.10	0.77	0.06	0.06	0.02	0.02	0.00
1988	0.07	3.02	0.18	1.30	0.12	0.40	0.12	0.11	0.00	0.03
1989	0.47	0.05	2.71	0.20	0.66	0.09	0.13	0.02	0.02	0.00
1990	0.77	0.67	0.02	1.19	0.05	0.17	0.04	0.00	0.00	0.00
1991	2.16	0.21	0.24	0.05	0.22	0.02	0.02	0.00	0.00	0.02
1992	2.85	2.08	0.23	0.24	0.00	0.47	0.02	0.08	0.03	0.06
1993	1.52	4.04	2.01	0.30	0.00	0.06	0.15	0.02	0.00	0.00
1994	0.91	0.77	0.81	0.67	0.12	0.05	0.02	0.17	0.06	0.00
1995	2.27	7.14	4.90	2.32	0.38	0.01	0.00	0.07	0.02	0.00
1996	1.31	0.54	0.93	1.04	0.49	0.14	0.01	0.01	0.00	0.01
1997	0.32	2.47	1.47	0.75	0.55	0.33	0.13	0.00	0.07	0.08
1998	4.32	2.79	2.47	0.72	0.41	0.18	0.16	0.02	0.00	0.01
1999	1.82	0.84	3.37	8.05	3.52	2.32	0.82	1.32	0.75	0.31
2000	4.14	2.82	5.48	3.10	1.10	0.66	0.13	0.27	0.09	0.19
2001	0.85	8.77	1.68	7.44	2.12	1.16	0.36	0.22	0.13	0.01
2002	0.12	1.91	22.27	5.45	8.54	1.87	0.62	0.53	0.68	0.10
2003	154.54	0.07	0.45	8.55	1.77	3.36	0.29	0.28	0.00	0.22
2004	1.63	163.65	0.22	0.84	13.62	1.18	4.54	0.50	0.67	0.15
2005	4.23	1.77	77.24	0.28	0.70	4.74	0.48	0.84	0.11	0.10
2006	0.94	4.54	0.73	48.36	0.40	0.43	1.28	0.10	0.21	0.02
2007	0.84	1.24	7.01	1.19	42.31	0.35	0.23	0.53	0.13	0.07

VPA Partial Recruitment

